Subject: Spatial Data Standards and Data Handling

This brief was prepared by Joe Frost (USFS) in collaboration with Matt Brown (IBM Sub-Contractor) and Steve Carty (IBM). Its purpose is to provide information for Fire Planners and GIS analysts developing spatial data layers for the Fire Program Analysis (FPA) system Preparedness Module (PM).

Topics covered include:

- A description of data flow between the client side GIS system, the FPA remote server, and the PCHA software
- Attributing Schemes for required spatial data
- Spatial data standards for Fire Management Units (FMU)
- Spatial data standards for Dispatch Location (DL)
- Spatial data accuracy standards for historic ignition point locations

It is important for anyone developing or using spatial data to understand the data flow and some of the data processing steps that occur at different stages. Figure one (page 2) shows the basic data flow.

Step 1: Development of Fire Management Units (FMU) entails the interagency fire planning group and spatial data specialists working together to accurately portray the FMUs on the ground. Some guidelines to use are if a feature such as stream, lake, road, or trail is used as a boundary for the FMU than that digital line should be taken from the local source of the appropriate scale and used in the FMU polygon when ever possible. All FMUs must be polygons.

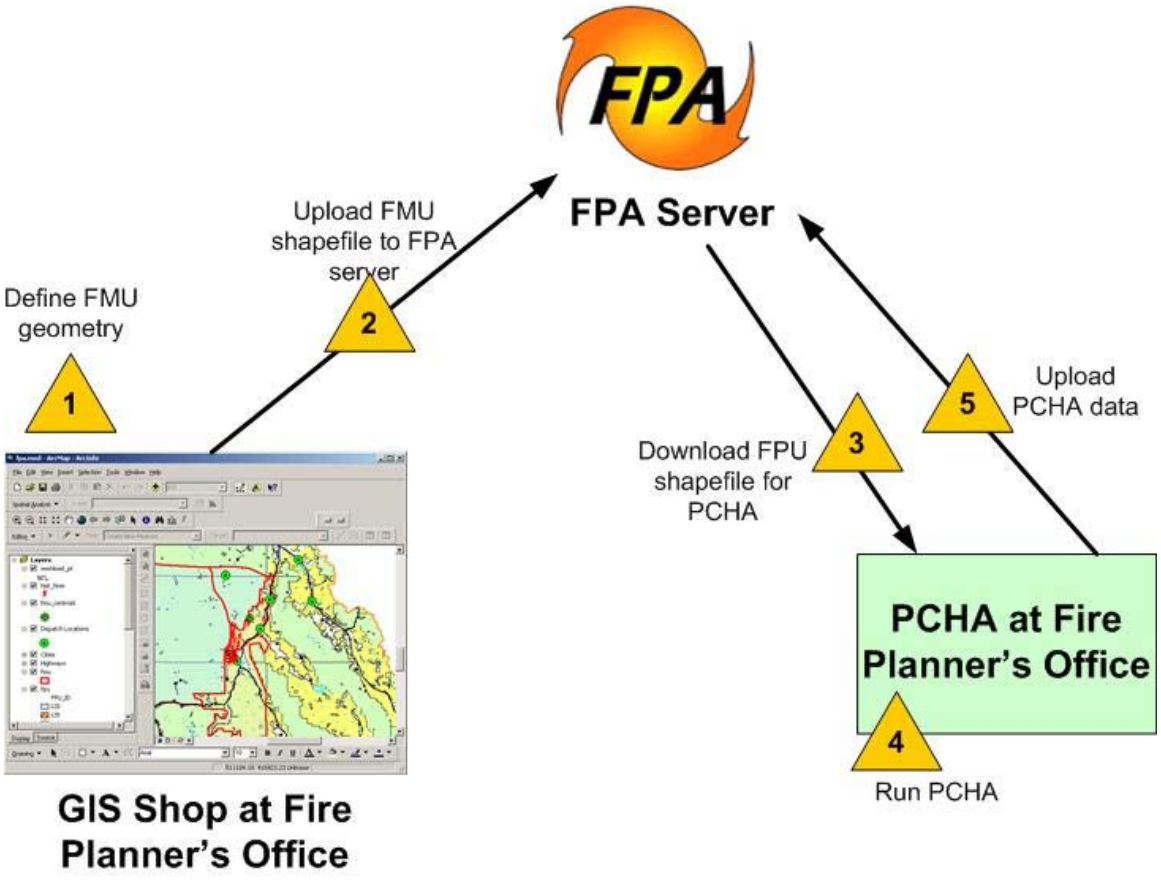
Step 2: The shape file that meets the data standard described in figure 2 below is uploaded through the Wide Area Network using the FPA upload utility. The FPA Server assigns an FMU unique ID attribute and then loads the shapefile into the FPA-PM SDE geodatabase. Inside FPA-PM, the fire planners associate FMUs to a Fire Planning Unit through a map interface. After FMUs are associated to define a FPU, the system makes the "FPU" shapefile available for download to the client.

Step 3: The FPU shape file is downloaded onto the client using utilities in FPA-PM.

Step 4: The Fire Planner then runs the PCHA software that prepares the data for an optimization run. This processing step includes assigning historic ignition locations, fuel models and workload points to each FMU and preparing the optimization run data.

Step 5: The optimization run data is then uploaded to the FPA server and verified. Any errors that the system encounters are reported back to the user. Further data entry and processing is accomplished using the FPA client.

Figure 1



1. Define FMU Shapefile using local GIS and local data sets
2. Upload FMU shapefile to FPA Server. (fmu.shp, fmu.dbf, fmu.shx)
3. Download FPU shapefile from FPA Server to run PCHA. (fpu.shp, fpu.dbf, fpu.shx)
4. Run PCHA to define Fire Events, Scenario Data, and FMU workload point
5. Upload PCHA Data (attribute data only, NO shapefiles) to FPA Server.

Figure 2

Fire Program Analysis Geospatial Data Standards

Data Source: Best available source with a target of NMAS 1:24,000 (1:63,360 for Alaska)
Data Format: ESRI Shape File
Projection: Geographic; Defined; Projection file (.prj) required
Units: Decimal Degrees
Datum: North American Datum 1983
Positional Accuracy:
The Spatial data standard for the following spatial features will be based on the Federal Geographic Data Committee (FGDC), National Standard for Spatial Data Accuracy (NSSDA); Reference document FGDC-STD-007.3-1998 for both horizontal and vertical accuracy.
Metadata: FGDC compliant, Layer Level

Layer: Fire Management Unit (FMU)

Feature Type: Polygon
Layer Description:
Any land management area defined by objectives, management constraints, topographic features, access, values to be protected, political boundaries, fuel types, major fuel regime groups, and so on that set it apart from the management characteristics of an adjacent unit. (FPA Glossary Version 2.4)

An FMU is represented spatially by a single or multi-part polygon. Each FMU is part of only one Fire Planning Unit (FPU) when submitted for budget consideration. Each FMU will have just one Workload point to model fire resource response times to, and therefore the Fire Planner must use her/his discretion when assigning multiple non-contiguous polygons to a single FMU.

References: Joe Frost (joe_frost@fs.fed.us), Matt Brown (matt.brown@ngc.com), Steve Carty (scarty@us.ibm.com)

Data Items:

Item Name	Type	Length	Example	Comments
Shape	String	20	Polygon	ESRI generated
*FMU_Name	String	60	Denver WUI zone 1	User Generated
*Date_Cur	Date	8	10022004	Currency of the polygon geometry
GIS_Ref	Long	34	8736233	User Generated – maps back to local GIS database
GIS_Other	String	60	Rosebud EIS FMU23	User Generated – maps back to local GIS database

Layer: Dispatch Location

Feature Type: Point
Layer Description: The designated headquarters or station, representing a more generalized location that is used as the dispatch point for initial attack forces, and from which travel distances to a Workload Point is measured.

References: Joe Frost (joe_frost@fs.fed.us), Matt Brown (matt.brown@ngc.com), Steve Carty (scarty@us.ibm.com)

Data Items:

Item Name	Type	Length	Example	Comments
Shape	String	20	Point	ESRI generated
*Loc_Name	String	60	Denver Engine Station #7	User Generated

* Note precision and scale is not required for these items (Decision: Prototype workshop Seattle WA, October 9, 2003) the system default values are acceptable.

Historic Fire Ignition Locations (Proposed Data Accuracy)

Several factors influence the accuracy of the FPA optimization analysis. One factor that that can skew the results is the location of historic fire ignitions. The ignition frequency of a FMU is based on the historic number of ignitions that fall within that FMU.

Prior to 1990 many units reported the location of fire ignitions using the Public Land Survey System (PLSS), which was referenced for location purposes by the Township, Range, Section and Quarter, Quarter Section. The conversion of the location of an ignition to the standard Latitude and Longitude that is needed to accomplish PCHA analysis should be taken seriously. There are several methods that can be used to convert from PLSS to Latitude Longitude, most are only accurate to the center of a section at best which roughly correlates to a horizontal accuracy of +/- 2600 feet.

The following is a proposed standard for Historic Fire Ignition locations and some common guidelines for developing the data for input into PCHA / FPA.

The Target data accuracy standard for fire ignition locations is + / - 600 feet.
The preferred projection is Geographic (Latitude Longitude) in North American Datum 1983 (NAD83).
Unless other wise recorded:

- Locations recorded prior to 1990 using the PLSS should be considered to be in North American Datum 1927, because most hardcopy maps were not redistributed in NAD83 until 1990 in most areas.
- Locations recorded prior to 1983 using Latitude and Longitude should be considered to be in NAD27.